

nomer Royal suggested for consideration whether it might not be advantageous to mount the telescope with an altitude and azimuth movement, by an overhanging fork inserted in a vertical pillar. If a rod were joined to the stalk of this fork, and, by means of an ordinary parallel motion, were compelled to move parallel to the axis of the telescope, and if any part of this rod were connected by another rod (adjustable in length according to the polar distance of the object) to a universal joint on the ground, in such a position that the line drawn from that universal joint to the stalk of the fork is a polar axis, then the motion of the telescope would be equatorial. For the observer, it was proposed that an observing-box should be fixed to the telescope, and that the access should be by a spiral staircase round the pillar, by a narrow platform near its top, and by a staircase along the side of the tube.

In conclusion, the Astronomer Royal observed that it was impossible to overrate the advance that had been made in the construction of telescopes by the two amateur constructors of whom he had spoken. Lord Rosse had shewn that it was possible, without any important manual labour, to produce with certainty, by means of machinery, mirrors of a size never before attained, and perhaps with a perfectness of definition which had not been reached before; and he had, by publication and by private communication, made these methods accessible to the world. This success was the more remarkable, because the whole of the work was done by workmen found on the spot; even the steam-engine, by which (to a late time) the whole of the machinery was driven, was made by native workmen under Lord Rosse's personal instructions. To Mr. Lassell also much was due, for the example which he had set of what may be done by a man possessing less ample means, and whose time is fully occupied in business; and much also for the elegant and compendious and manageable apparatus arranged by him, which promises to be of the greatest use in the construction of large object-glasses as well as of mirrors.

On Irradiation. By Professor Powell.

After adverting to the history of researches on this subject, the author dwells particularly on the method of exhibiting the phenomenon adopted by M. Plateau, which forms the basis of all his own experiments, and which consists of a card or lamina, cut so that one half of a long parallelogram is cut out whilst the other remains, having the portions at the sides cut away. Viewed against the light, the enlargement of the bright half, in breadth, is seen contrasted with the opaque, and might be subjected to measurement.

The first question on the subject refers to the supposition of a peculiar *physiological cause* affecting the eye to produce the apparent enlargement of the bright image. After fully allowing for some portion of such phenomena being fairly attributable to ocular

causes, such as dazzling, contrast, &c., experiments are adduced to shew that *precisely similar phenomena are produced in an artificial eye, or camera obscura*; whence the hypothesis of any peculiar affection of the retina is rendered unnecessary. The same conclusion is further confirmed by *photographic* impressions of the image of the card cut as before, which exhibit the same enlargement. Specimens of these impressions, taken by Mr. N. S. Maske-lyne, were exhibited.

These results, clearly pointing to an *optical* cause, agree with the conclusions of the undulatory theory, relative to the “diffraction of a lens,” as investigated by Mr. Airy, which apply to the eye considered as an optical instrument, as well as to the object-glasses of telescopes; in either case *the image of a point* being an *extended disc*, which, if the light be bright enough, will be surrounded by rings. A luminous surface will exhibit a like enlargement.

Without reference to any theory, it is an ascertained law that the enlargement *increases with the intensity of the light*. The enlargement also is formed with a rapid decrease in brightness towards the edge. On these grounds, it is easy to explain the fact of the great diminution or total destruction of irradiation by the *interposition of lenses*, which would follow immediately from the weakening of the intensity in proportion to the square of the linear magnification. The author has examined particularly into the extent to which this effect takes place, and announces that *low powers* (from 5 to 20) *are sufficient to obliterate all irradiation even in the most intense light which the eye can bear*.

Various results of M. Plateau and others as to the effects of *contrast* in making a narrow bar or wire continue visible, though the irradiations ought to overlap, have been examined, and found only to hold good with low intensities.

The author next considers the effect in *telescopes*. Here that portion of the effect which regards the *ocular* image being placed out of consideration from the influence of the magnifying power (already referred to), we have only to consider that part which affects the *focal image* of the object-glass. *The diminution of the aperture increases the irradiation*; but at the same time it diminishes the light. At a certain point, then, these two causes counterbalance each other, and no further enlargement takes place. This limit will vary with each instrument, and we have no certain grounds on which to determine it. Various observations are referred to in which its influence is evinced.

The astronomical facts connected with these causes are then examined from the testimony of various observers. In particular the application of these principles to some of those singular phenomena occasionally noticed in eclipses, transits, occultations, &c. seems easy in theory abstractedly considered. The difficulty lies in explaining why they are observed only in some cases and not in others. The author dwells particularly on the desirableness of a closer attention to stating *all* the conditions of the *telescopes* employed, especially the *apertures*.

In particular the phenomenon "*the neck*," in the transits of *Mercury* and *Venus*, would be an obvious consequence of irradiation, which would diminish the planet's disc and enlarge that of the sun, except at the small portion of the circumferences in contact, when the absence of *both* irradiations would produce a "*neck*."

Both theory and experiment shew that a small dark disc would have for its image a diminished disc with a bright internal concentric ring, which, if the disc be very small, will be contracted to a central bright point. This seems to agree with the appearance noticed by several observers in the transit of a white spot on the centre of the planet. On a former occasion, however, Professor Moll and others saw such a spot *excentrical*. The projection of a star on the *bright* limb of the moon would also be an effect of irradiation, which would cause the disc of the moon simply to overlap the star.

Lastly, the author suggests a method for obtaining *measures of the amount of irradiation under any given light*, by placing a card, cut as before, at the focus of a lens, opposite to the object-glass of a telescope, and attached to it by a short tube; when the enlargement of the image of the card, illumined by the light from any source, can be subjected to the exact measurement of the micrometer of the telescope.

On a New Method of Observing Transits. By A. D. Bache, Esq.,
Director of the American Coast Survey.

"Permit me to invite your attention, and that of the members of the Royal Astronomical Society, to a brief abstract of an official report made to me on the 15th inst. by Mr. Sears C. Walker, one of the assistants of the U. S. Coast Survey. It relates to the printing, by the use of an electro-magnetic clock, in connexion with Morse's telegraph register, of the actual dates of any celestial phenomena, which are ordinarily made the subject of observation by astronomers.

"The electro-magnetic clock of Mr. Wheatston is described in the *Proceedings* of the Royal Astronomical Society for Nov. 19th, 1841. Mr. Steinheil has described his in Schumacher's *Astronomical Jahrbuch* for 1844.

"Recently Prof. Bond and Dr. Locke have invented different processes, which are described in Mr. Walker's Report.

"Prof. Bond proposes to make circuit by the metallic contact of insulated portions of the pallet and escapement-wheel. Dr. Locke, like Mr. Wheatston, uses a metallic wheel on the arbor of the seconds' hand. This wheel has sixty teeth, each of which when horizontal strikes against a platinum lever or tilt-hammer, weighing two grains. The rising and falling of the hammer from a bed of platinum breaks and makes the galvanic circuit. The fulcrum of the tilt-hammer and the platinum bed rest severally on a small block of wood.